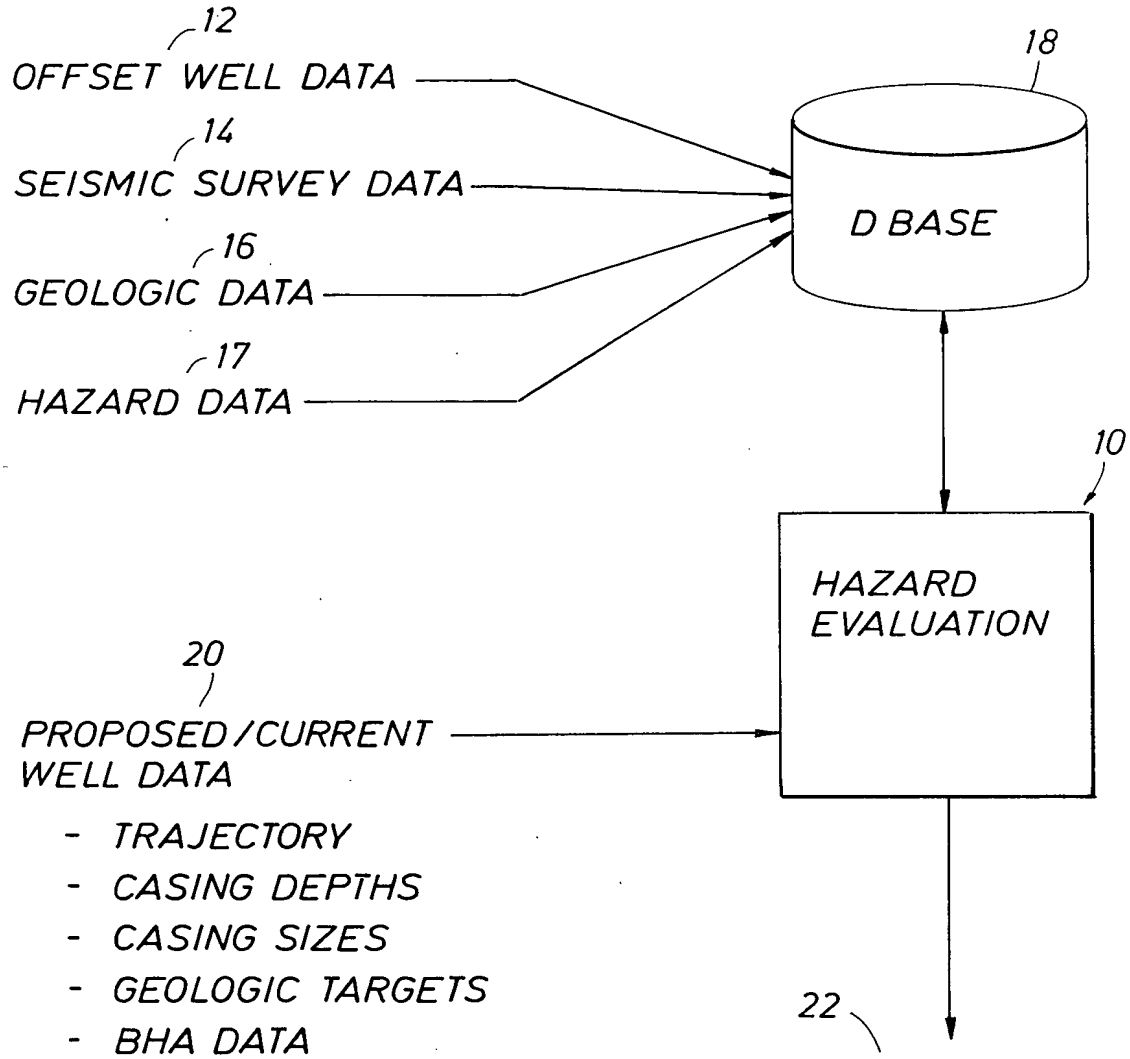


FIG. 1

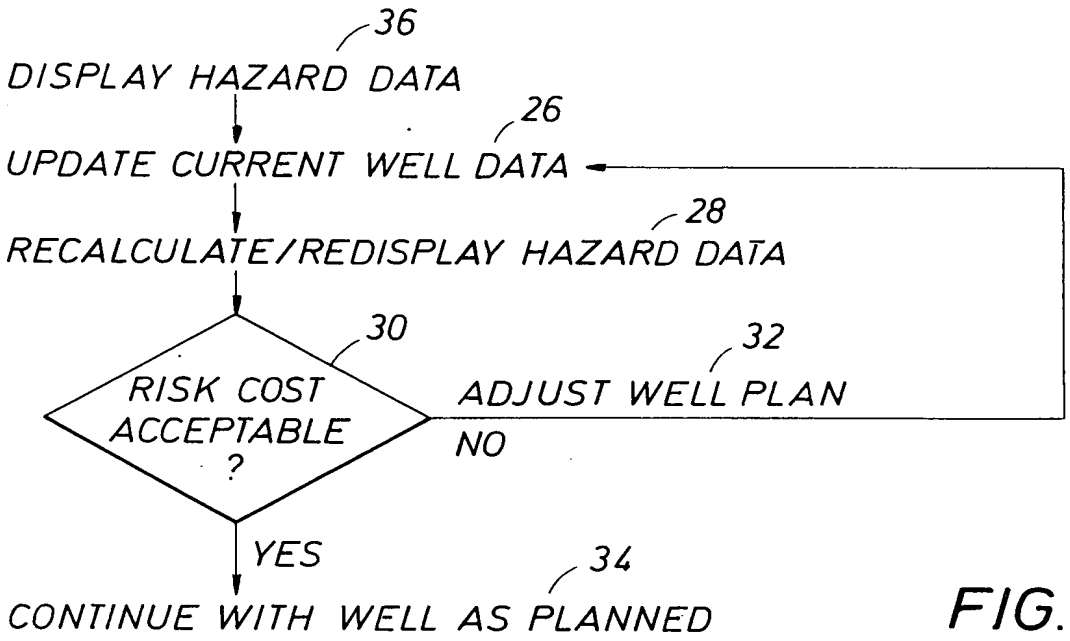

36
DISPLAY HAZARD DATA
26
UPDATE CURRENT WELL DATA
28
RECALCULATE/REDISPLAY HAZARD DATA
30
RISK COST ACCEPTABLE ?
32
ADJUST WELL PLAN
NO
YES
34
CONTINUE WITH WELL AS PLANNED

FIG. 2

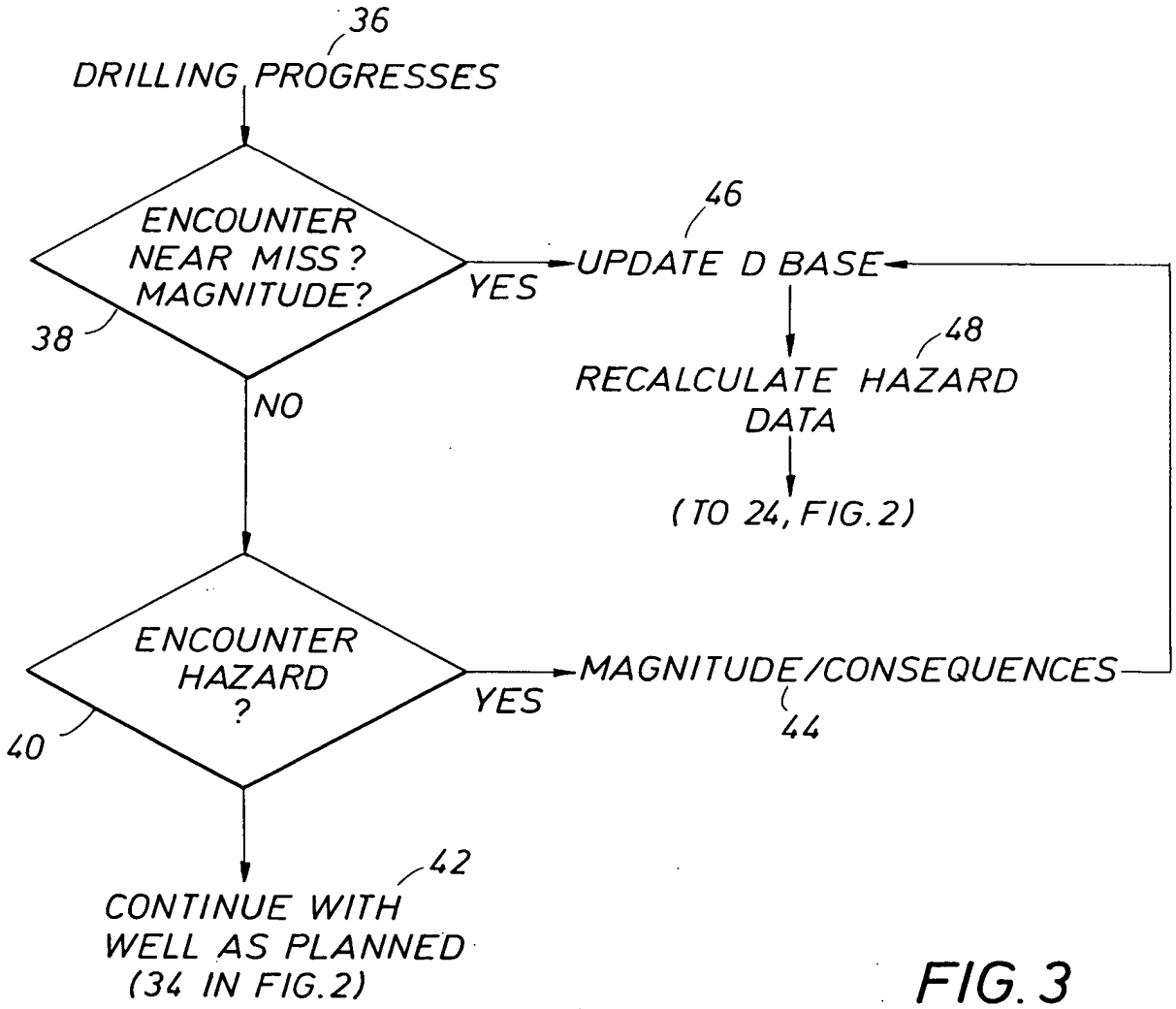

36
DRILLING PROGRESSES
ENCOUNTER NEAR MISS? MAGNITUDE?
38
YES
46
UPDATE D BASE
48
RECALCULATE HAZARD DATA
(TO 24, FIG. 2)
NO
ENCOUNTER HAZARD ?
40
YES
MAGNITUDE/CONSEQUENCES
44
42
CONTINUE WITH WELL AS PLANNED (34 IN FIG. 2)

FIG. 3

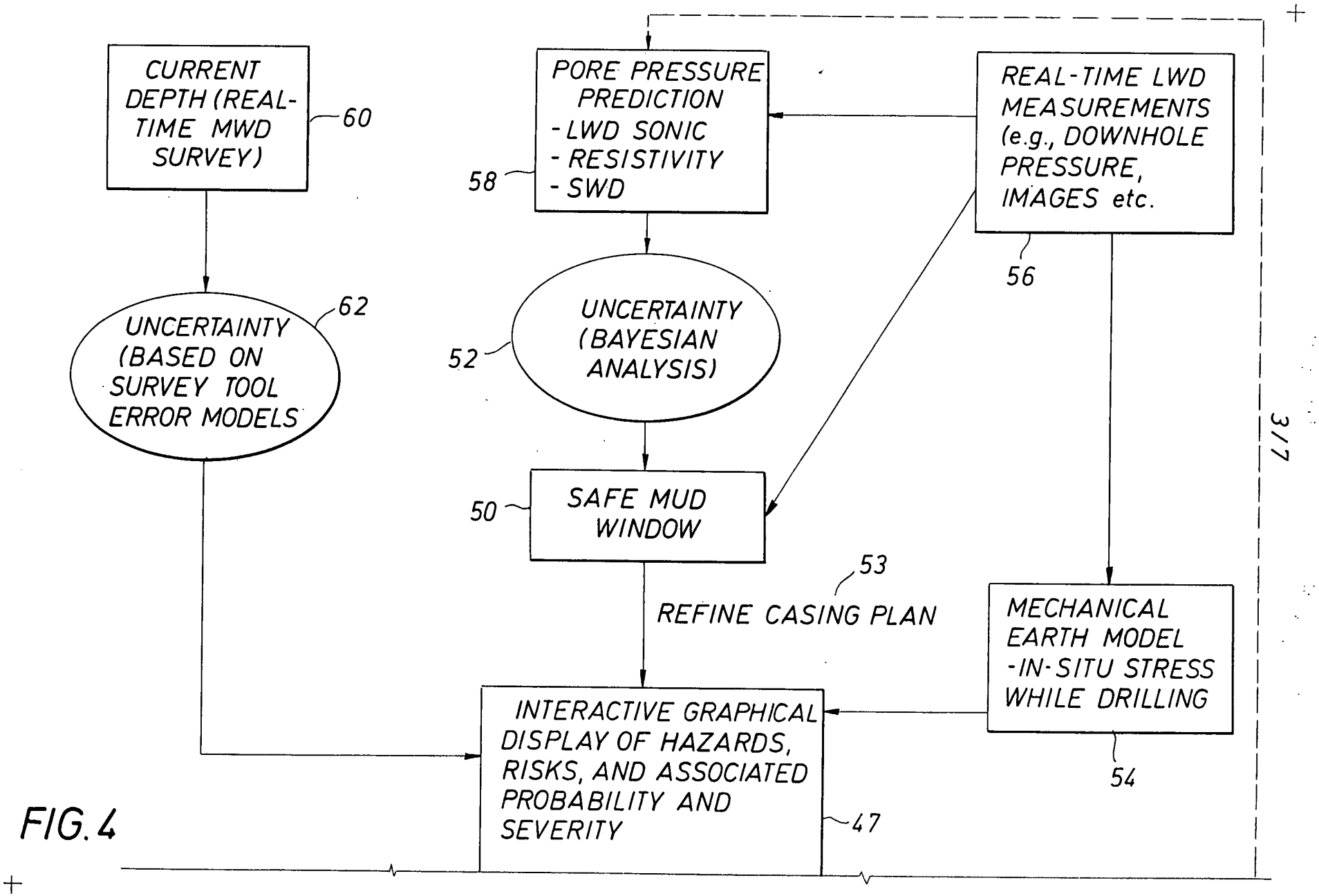

CURRENT DEPTH (REAL-TIME MWD SURVEY)
60
PORE PRESSURE PREDICTION
- LWD SONIC
- RESISTIVITY
- SWD
58
REAL-TIME LWD MEASUREMENTS (e.g., DOWNHOLE PRESSURE, IMAGES etc.
56
UNCERTAINTY (BASED ON SURVEY TOOL ERROR MODELS
62
UNCERTAINTY (BAYESIAN ANALYSIS)
52
SAFE MUD WINDOW
50
53
REFINE CASING PLAN
MECHANICAL EARTH MODEL -IN-SITU STRESS WHILE DRILLING
54
INTERACTIVE GRAPHICAL DISPLAY OF HAZARDS, RISKS, AND ASSOCIATED PROBABILITY AND SEVERITY
47
317

FIG. 4

FIG. 4
(CONTINUED)

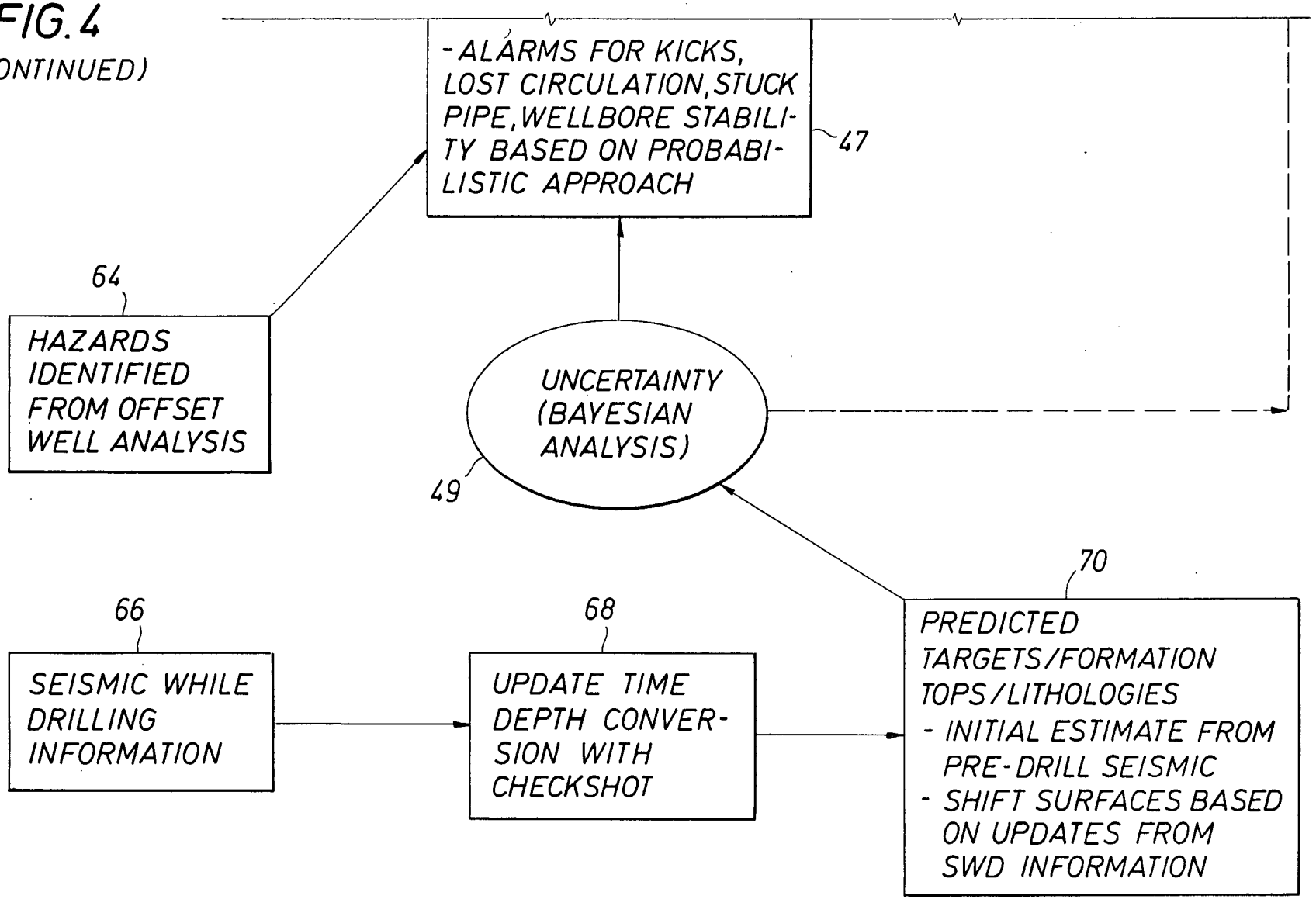


FIG. 7 (CONTINUED)

7	2725-2850m	2040-2157m	7) POTENTIAL BREAK-OUT USING 1.65 sg MUD WEIGHT	- MONITOR CAVING VOLUMES - OBSERVE CAVING MORPHOLOGY
8	2883-2925m	2189-2228m	8) POTENTIAL MUD LOSSES IN FRACTURED BALDER-SELE IF ECD EXCEEDS 1.68 sg.	- KEEP ECD LOW(<1.68 sg) - OBSERVE FOR LOSSES - LCM MAY BE NECESSARY

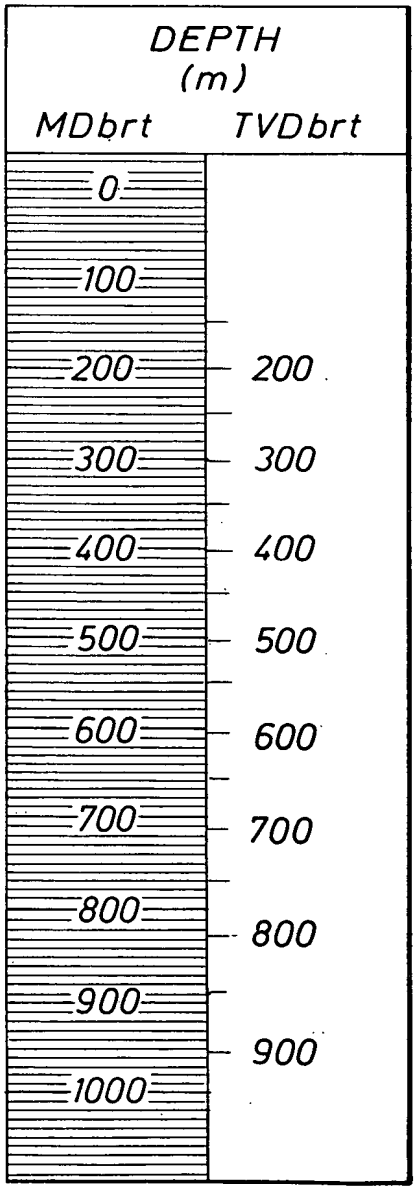


FIG. 5

FIG. 7

1	1350-1650m	1103-1253.5 m	1) POTENTIAL MUD LOSSES USING 1.65sg MUD WEIGHT	- KEEP ECD LOW - OBSERVE FOR LOSSES - LCM MAY BE NECESSARY - MAINTAIN GOOD HOLE CLEANING
2	1025-1900m	941-1394m	2) WELL INCLINATION BETWEEN 55-65 DEG. POSSIBLE AVALANCHING CUTTINGS BEDS.	- ENSURE GOOD HOLE CLEANING AND CAREFUL TRIPPING OF BHA THROUGH AND BELOW THIS ZONE
3	1675-1828m	1266-1351m	3) POTENTIAL MUD LOSSES IF ECD EXCEEDS 1.68 sg	- KEEP ECD LOW (< 1.68 sg) - OBSERVE FOR LOSSES
4	1850-2070m	1364-1505m	4) POTENTIAL BREAKOUT USING 1.65 sg MUD WEIGHT	- MONITOR CAVING VOLUMES - OBSERVE CAVING MORPHOLOGY
5	1980-2505 m	1444.5-1844.5 m	5) POTENTIAL LOSSES DUE TO FAULT ZONE	- KEEP ECD BELOW 1.70 sg - MONITOR MUD LOSSES CAREFULLY - MONITOR FOR FRACTURE RELATED CAVINGS - AN INCREASE IN MUD WEIGHT NOT RECOMMENDED DUE TO DESTABILISATION
6	1990-2070m	1450-1500m	6) POSSIBLE BEDDING PARALLEL FORMATION FAILURE. HIGH VOLUMES OF CAVINGS, DANGER OF	- MONITOR CAVING MORPHOLOGY FOR BEDDING PARALLEL FAILURE - MAINTAIN GOOD HOLE HOLE CLEANING, REDUCE ROP IF CAVING VOLUME BECOMES EXCESSIVE WITH INCREASED HOLE CLEANING. - DO NOT INCREASE MUD WEIGHT

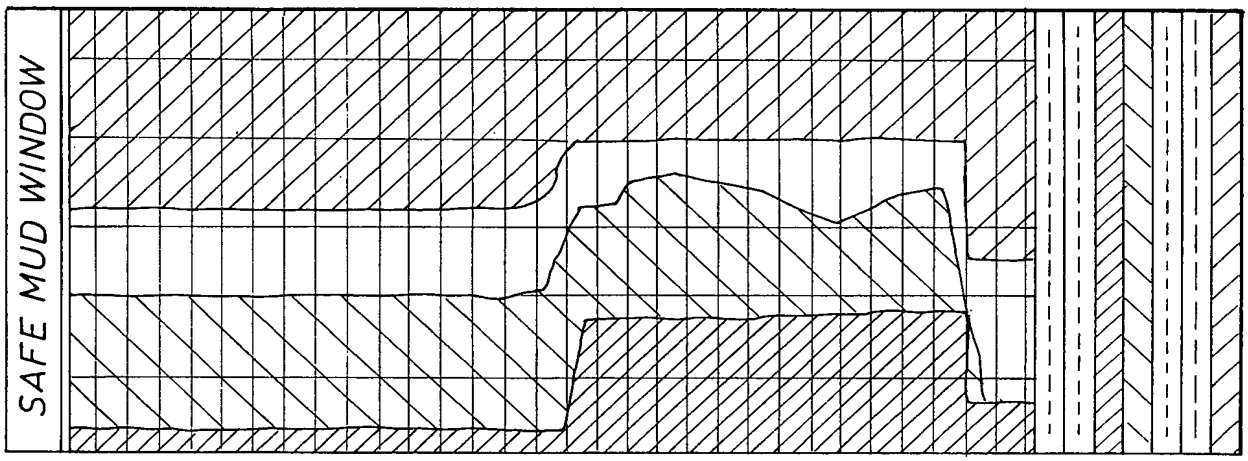
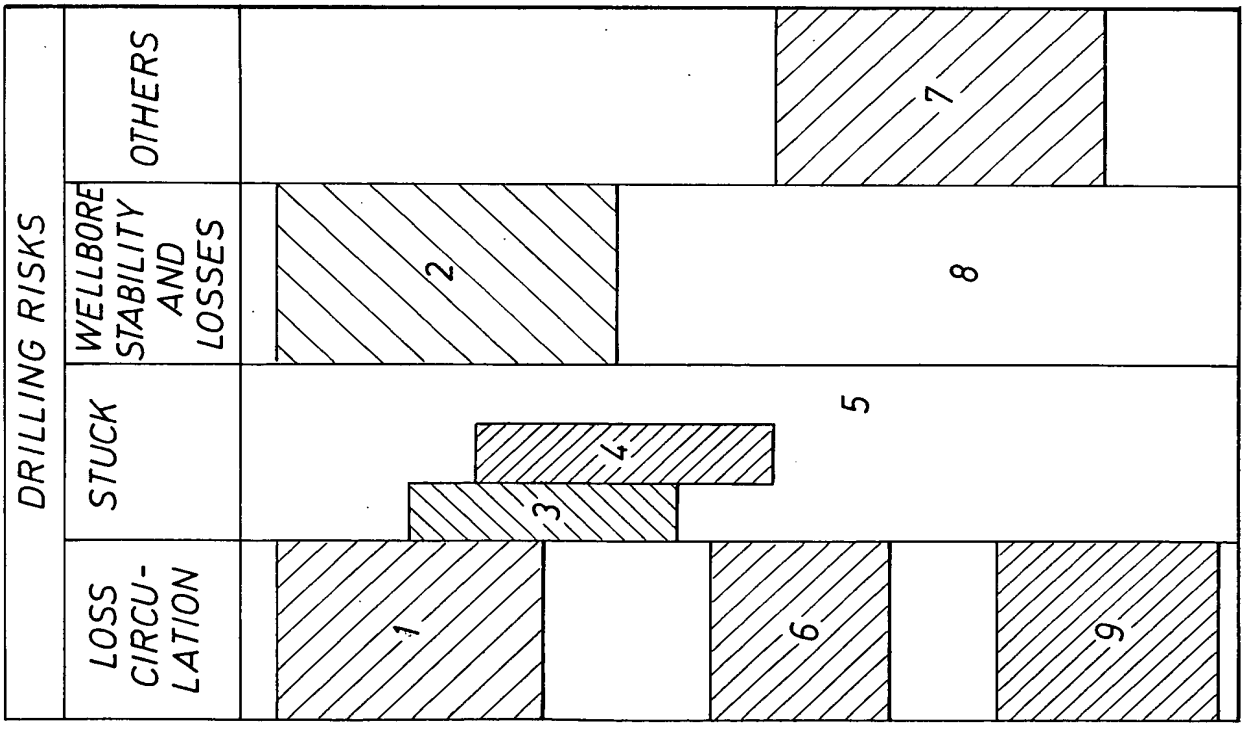

SAFE MUD WINDOW

FIG.8

FIG.6


DRILLING RISKS
LOSS CIRCU-LATION
STUCK
WELLBORE STABILITY AND LOSSES
OTHERS
1
2
3
4
5
6
7
8
9